FCC Implementation of the National Broadband Plan

Office of Engineering and Technology

DoD Spectrum Workshop
December 14, 2011

Note: The views expressed in this presentation are those of the author and may not necessarily represent the views of the Federal Communications Commission

National Broadband Plan

- National Broadband Plan (NBP) – Published in March 2010
- Comprehensive plan to facilitate broadband deployment in the USA
- FCC has acted to implement NBP:
  - Deployment gap – USF & ICC reform
  - Broadband skills gap – “Connect to Compete”
  - Adoption gap – E-Gov’t & explore E-rate
  - Spectrum gap – Revamp spectrum policy

Mobile Demand Is Creating a Spectrum Crunch

- 300 million mobile subscribers in the U.S., and 90% of us keep our mobile device within arms length 24 hours a day
- Smartphone sales have eclipsed PC sales
- Mobile broadband is being adopted faster than any computing platform in history
- A typical smartphone places 24 times as much demand on spectrum as an old feature phone
- Tablets demand 120 times as much
- Multiple experts expect that mobile demand for spectrum will increase more than 35x in the next few years (3,500%)
- Mobile phone subscriptions now top the number of people - - 328 million subscriptions

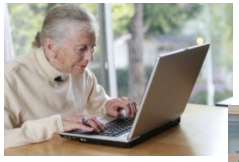
24/7

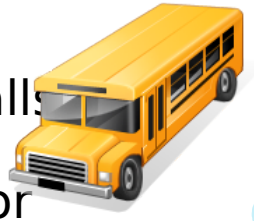
24X

120X

Mobile Will Create New Businesses, New Jobs, and New Benefits

- Ability to send or receive video anywhere, any time:
  - Video conferencing
  - Check on an elderly parent living alone
  - 18 million college students - - see them every weekend
- Consult with mechanic when car breaks down
- After accident - video link with a doctor
- School buses can become rolling study halls
- Farmers in their fields can track weather or commodity prices in real time
- Plumbers or electricians can consult in real time with colleagues, or download video tips
- TIA: $860 billion in productivity gains for U.S. businesses by 2016





FCC Response to the Spectrum Crunch

- Spectrum gap: Only about 50 MHz “in the tank”
- NBP called for making 500 MHz available for wireless broadband within 10 yrs, 300 MHz of which to be made available within 5 yrs
- FCC has taken numerous actions since plan adopted:
  - Opened 25 MHz of WCS spectrum for mobile broadband
  - Proposed initial steps to open TV spectrum to mobile broadband
  - Provided flexibility for terrestrial in the mobile satellite service
  - Finalized rules for TV white space
  - Proposed to revamp experimental licensing
  - Began inquiry on dynamic spectrum access
  - Adopted rules to increase efficiency for backhaul spectrum

Federal Search for Spectrum

- Presidential Memo issued on June 28, 2010 on unleashing the wireless broadband revolution
- NTIA to collaborate with the FCC to make available a total of 500 MHz of Federal and nonfederal spectrum over the next 10 years:
  - Suitable for both mobile and fixed wireless broadband use
  - Available to be licensed by the FCC for exclusive use or made available for shared access by commercial and Government users in order to enable licensed or unlicensed wireless broadband technologies to be deployed
- NTIA released spectrum reports in November 2010
  - Fast-track bands – 1695 – 1710 MHz; 3550 – 3650 MHz
  - Plan to Identify 500 MHz of spectrum
- FCC Spectrum Task Force issued public notice on March 8, 2011 inviting comment on frequency bands in fast-track report
- NTIA Policy & Planning Steering Group focusing on 1755 – 1850 MHz; analysis completed and report expected soon

FCC Baseline Spectrum Inventory

- New tool that provides an overview of FCC license management data
- Enables users to digest licensing information via a simple & easy-to-use portal
- The tool includes data for active licenses from all of the Commission's licensing systems:
  - CDBS - Consolidated Database System,
  - COALS - Cable Operations and Licensing System
  - ELS - Experimental Licensing System
  - IBFS - International Bureau Filing System
  - And ULS - Universal Licensing System
- Based on information currently stored in the FCC's electronic licensing records and our rules, such as the table of frequency allocations
- Provides "one-stop shopping" for much of this information, using plain language and providing new data aggregation and display functions, such as mapping capabilities

NBP Proposed New Policy Enabler: Incentive Auctions

- Virtually all attractive spectrum is currently occupied today
  - Some allocations may not be currently used to fullest potential
- Incentive auctions would share auction proceeds with the current occupant to motivate voluntary relocation of incumbents
  - Otherwise, no incentive for current occupant to give back spectrum
- Modification of FCC auction authority needed
  - Currently does not permit sharing of auction proceeds
  - Draft legislation has been introduced – strong bi-partisan support
- Incentive auctions are win-win-win-win proposition:
  - Economy wins - Innovation, job creation, economic growth
  - Consumers win - Advancements in wireless products and services
  - Taxpayers win - Multiple $ billions to Treasury
  - Contributing licensees win - Capital infusion to support business

Potential Applications of Incentive Auctions

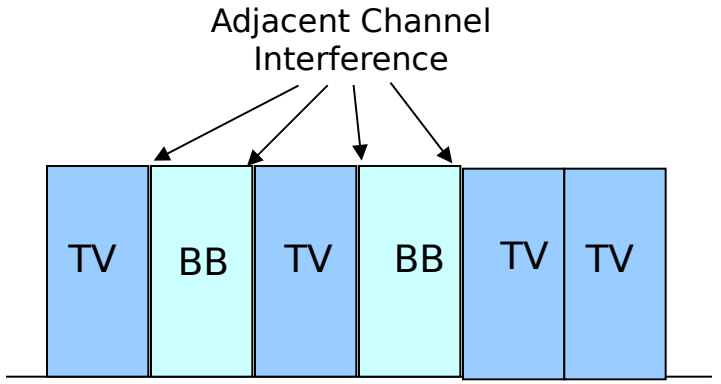
- Television Bands (UHF/VHF)
  - Excellent propagation characteristics
  - Adjacent to recently-auctioned 700 MHz band
  - Opportunity to strengthen television sector with cash infusion
  - 49 TV channels are available, but only 31 used for full power TV, even the largest markets and far fewer in most markets
- Mobile Satellite Spectrum (MSS)
  - Good spectrum, underutilized
  - 2 GHz “S-Band” may be ripe for incentive auction

TV Broadcast Incentive Auctions

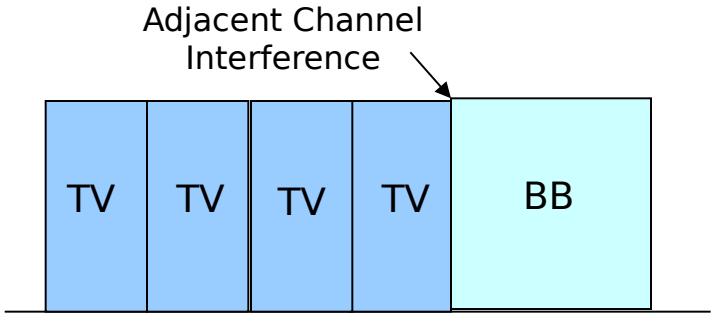
- Details would depend on legislation & rule making
- Broadcaster participation in incentive auction would be voluntary
- In an incentive auction, in exchange for a share of auction proceeds a broadcaster could:
  - Contribute one or more 6 MHz channels
  - Choose to move from U to V
  - Share spectrum with another broadcaster
  - Or choose not to participate!

The FCC Would Need to Realign the Spectrum After the Auction

- FCC would realign the spectrum into blocks to maximize efficiency and value
- Interference between television and wireless operations would increase without realignment
- The FCC would work with industry to minimize any interference or coverage impacts of realignment, as we did for the DTV transition
- Stations could stay in their current bands
- Stations keep current channel numbers
- Moves to a lower band would be voluntary based on broadcaster reserve price



Without Realignment:
Reduced Broadband Bandwidth

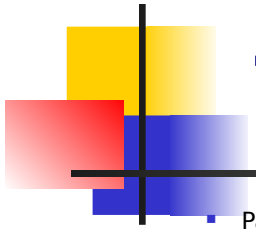


With Realignment: Accommodates Increased Broadband Bandwidth

Benefits from Spectrum Auctions

- FCC has auctioned spectrum licenses since mid-90s
- Enhanced competition & growth of wireless services
- Most efficient, transparent, effective way to assign mutually-exclusive licenses
- Spectrum auction receipts to U.S. Treasury
  - Over $50 billion since 1993
  - Over $30 billion in past 5 years
- Demand for spectrum remains strong
- TV bands incentive auction could generate $25 billion in potential revenures, plus ten times that in economic benefits

Unlicensed Devices: Part 15



- Part 15 provides for operation of low power radio transmitters without the need for the user to obtain a license
- Operating conditions:
  - May not cause harmful interference
  - Must accept any interference received
- Minimizes likelihood of interference by:
  - Identifying permissible frequencies
  - Limiting power to very low levels
  - Requiring equipment authorization
- Permissible frequencies:
  - Unlicensed devices are not “allocated” spectrum (except Unlicensed-PCS)
  - Generally operate on unused spectrum or on “overlay” basis
  - Or in ISM “junk bands”: 915 MHz, 2.4 GHz, 5.8 GHz
  - Restricted from operating in public safety & low signal bands
- Industry has developed voluntary protocol standards within the framework of the rules: Wi-Fi, Bluetooth; Zigbee; etc.

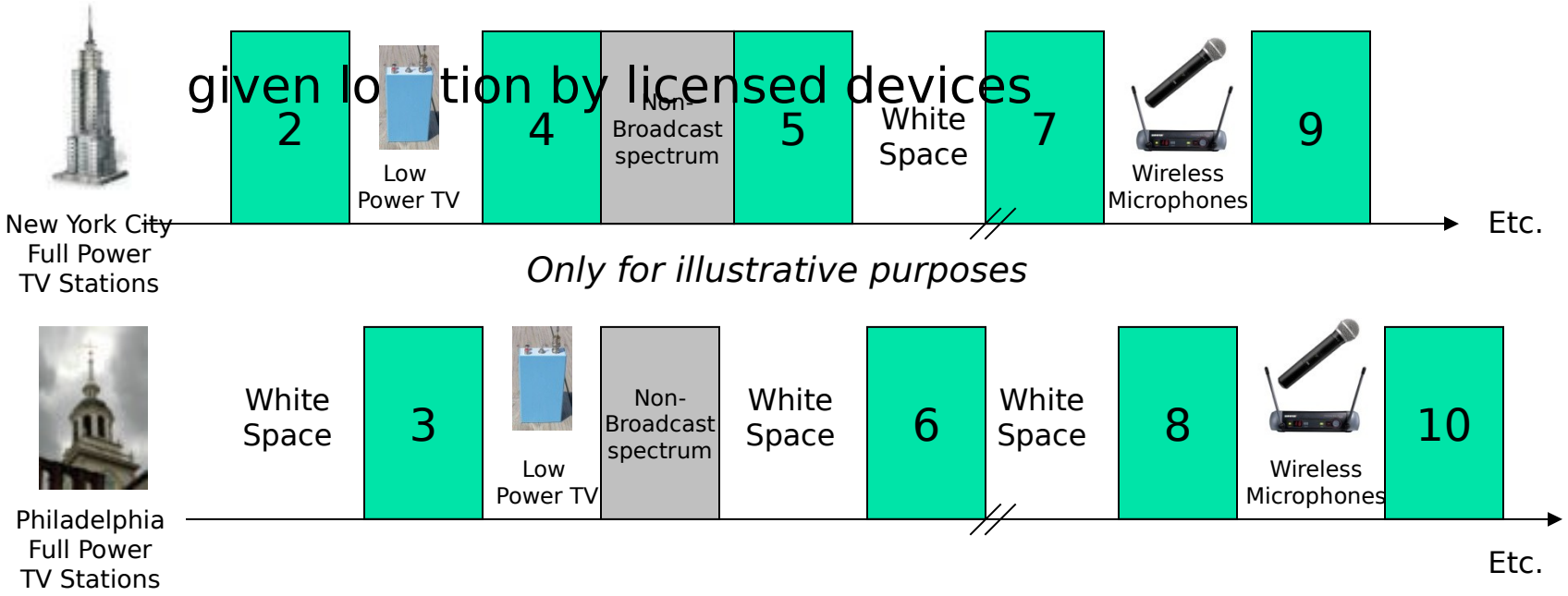
Wide Variety of Applications

- **Wi-Fi devices - Home and business networks; hot-spots**
- Community, urban & rural broadband networks by WISPs
- Bluetooth headsets & keyboards
- Automobile keyless entry
- Wireless baby monitors
- In-home video distribution
- Remote control toys
- Toy walkie-talkies
- Utility meter readers & smart grid energy control
- Tank level meters
- Traffic light controls
- Crane controls
- Lighting controls & dimmers
- Wireless door bells

- Cordless phones
- Garage door opener controls
- Sensors for automatic doors
- Industrial automation controls
- RF ID systems
- Retail anti-theft systems
- Security alarm systems
- Wireless speakers
- Satellite Radio-to-FM radio
- Convergence w licensed devices
- Medical camera pills
- Medical panic alerts
- Meat thermometers
- Inventory control
- Pool cover controllers
- Diaper wetness sensor
- ***And the list goes on . . .***

TV White Spaces

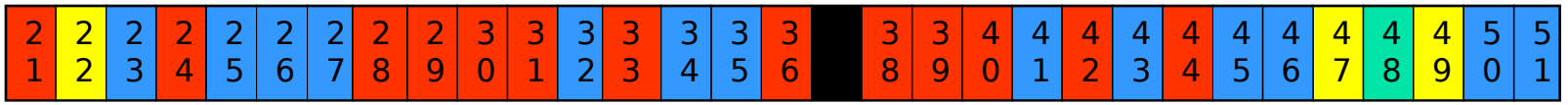
- TV channels are “allotted” to cities to serve the local area
- Other licensed and unlicensed services are also in TV bands
- “White Spaces” are the channels that are “unused” at any given location by licensed devices



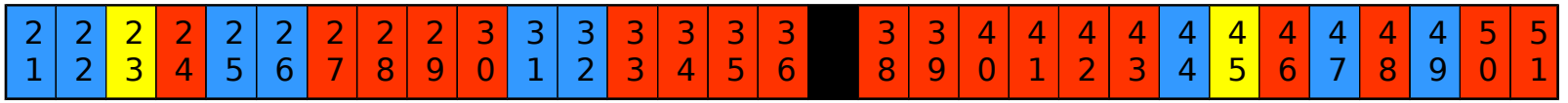
TVWS Spectrum Availability

- Available spectrum varies by location
- In rural areas many channels are available
- In big cities only a few channels may be available
- Examples of availability in UHF channels 21 – 51 (Illustrative):

New York



Washington, DC



Chicago

Full Service DTV Station

Low Power TV Station

Channel Open/ Adjacent to TV

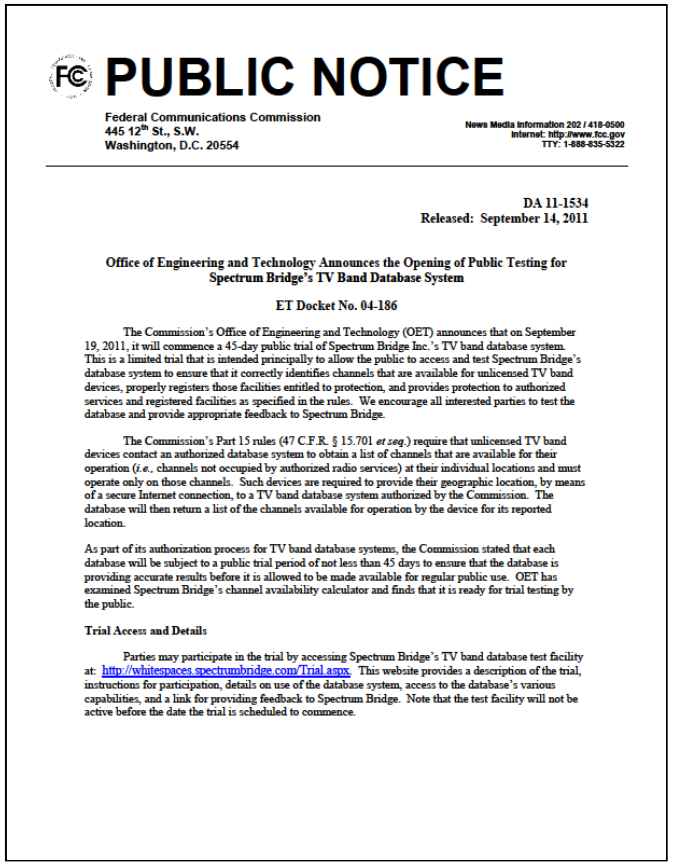
Channel Open/ Not Adjacent to TV

Overview of TVWS Rules

- Established a new spectrum access model:
  - Device identifies its location and accesses a data base that tells the device what spectrum is available at that spot
  - Data base identifies protected services & locations: Full power TV, low power TV, wireless microphones
  - Model is potentially transferrable to other spectrum bands
- Provides access to “beachfront” spectrum
- Potential applications: Super Wi-Fi, rural broadband; health care; smart grid; limited only by imagination

TV White Space Progress

- Selected 10 data base administrators
- Held 3 public workshops
- Conducted 1st TVWS data base beta test (Spectrum Bridge), received and are reviewing comments
- Announced start of 2nd TVWS data base test (Telcordia)
- Working out details of wireless microphone registration process
- Accepting applications for equipment certification
- Extensive info at: http://transition.fcc.gov/oet/whitespace/



PUBLIC NOTICE

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Office of Engineering and Technology Announces the Opening of Public Testing for Spectrum Bridge's TV Band Database System

ET Docket No. 04-186

The Commission's Office of Engineering and Technology (OET) announces that on September 19, 2011, it will commence a 45-day public trial of Spectrum Bridge Inc.'s TV band database system. This is a limited trial that is intended principally to allow the public to access and test Spectrum Bridge's database system to ensure that it correctly identifies channels that are available for unlicensed TV band devices, properly registers those facilities entitled to protection, and provides protection to authorized services and registered facilities as specified in the rules. We encourage all interested parties to test the database and provide appropriate feedback to Spectrum Bridge.

The Commission's Part 15 rules (47 C.F.R. § 15.701 *et seq.*) require that unlicensed TV band devices contact an authorized database system to obtain a list of channels that are available for their operation (*i.e.*, channels not occupied by authorized radio services) at their individual locations and must operate only on those channels. Such devices are required to provide their geographic location, by means of a secure Internet connection, to a TV band database system authorized by the Commission. The database will then return a list of the channels available for operation by the device for its reported location.

As part of its authorization process for TV band database systems, the Commission stated that each database will be subject to a public trial period of not less than 45 days to ensure that the database is providing accurate results before it is allowed to be made available for regular public use. OET has examined Spectrum Bridge's channel availability calculator and finds that it is ready for trial testing by the public.

Trial Access and Details

Parties may participate in the trial by accessing Spectrum Bridge's TV band database test facility at: http://whitespaces.spectrumbridge.com/Trial.aspx. This website provides a description of the trial, instructions for participation, details on use of the database system, access to the database's various capabilities, and a link for providing feedback to Spectrum Bridge. Note that the test facility will not be active before the date the trial is scheduled to commence.

FCC Notice of Inquiry on Dynamic Spectrum Access (ET Docket 10-237)

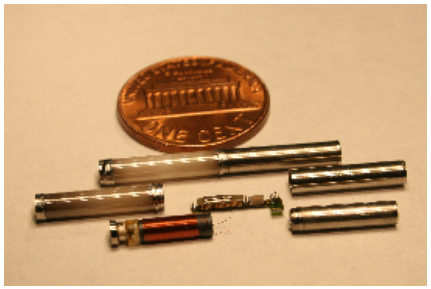
- Notice of Inquiry (NOI) considers how dynamic access radios and techniques can provide a more intensive and efficient use of spectrum
- Seeks comment on the current state of the art and how FCC can promote these technologies - - test-beds or modifying its spectrum management practices and policies
- Covers both licensed services and unlicensed devices
- What spectrum bands would be most suitable?
- Asks whether TV White Space model might be used for other bands
- Asks whether and how to incorporate spectrum sensing for other bands
- Asks whether FCC provisions for secondary market arrangements could be enhanced to increase use by dynamic access radios
- Asks how to improve FCC “Spectrum Dashboard” for DSA

Experimental Licensing Notice of Proposed Rule Making (ET Docket No. 10-236)

- Notice of Proposed Rule Making (NPRM) seeks to promote research and development of new radio technologies, devices, and applications.
- Proposed to create a new type of Program License, which would give qualified entities broad authority to conduct a program of research without the need for approval of each experiment.
- Proposed three types of Program Licenses:
  - **Research license** would allow universities, laboratories, and other qualified research institutions to conduct experiments over a wide variety of frequencies and other operating parameters, without the need for individual authorization or reauthorization for each individual experiment.
  - **Geographic "innovation zones"** – generally relatively remote locations - where researchers could conduct a wide range of experiments under certain general conditions.
  - **Medical institutions** to innovate and develop new devices that can save lives, have a significant impact on reducing medical costs, and provide new treatment options for our wounded service men and women.
- Proposed ways to streamline and clarify the existing rules such as expanding opportunities for researchers and manufacturers to conduct market trials

Medical Micro-Power Networks (MMNs)

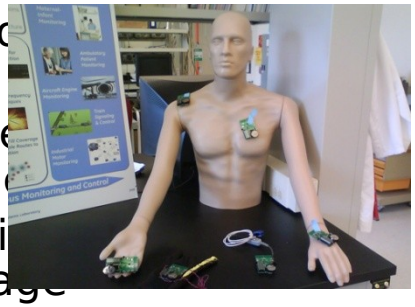
- Commission adopted rules to provide for MMNs at Nov. 30 agenda meeting
- MMNs are ultra-low power wideband networks of multiple implanted transmitters that provide functional electric stimulation to activate and monitor nerves and muscles:
  - Take the place of damaged nerves to restore sensation, mobility, and other functions to paralyzed limbs and other parts of the body
  - Applications include allowing paraplegics to stand, restoring hand grasp function for quadriplegics, and restoring patient's bowel and bladder function



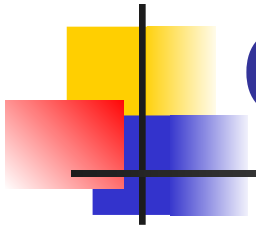
- Based on smart radio spectrum sharing technology:
  - Capable of operating across multiple frequency bands
  - Monitors quality of the radio link, switching frequency bands, notching out of interfering signals, and error correction coding
  - Testing demonstrates devices are able to reliably operate in spectrum shared with Federal Gov't and commercial services
  - Spectrum sharing technologies will become more important as demand for spectrum continues to grow

Medical Body Area Networks (MBANS)

- MBANS are very short-range networks consisting of multiple body-worn sensors (eg, on a patient's chest, back, arms, etc.) and a nearby hub station:
  - Sensors take readings of key patient-specific informatic (eg, temperature, pulse, blood glucose level, etc.)
  - Antennas embedded in sensors make it possible to wire transmit data to body-worn or closely located hub devi
  - Hub devices may process data locally and/or transmit i wirelessly for centralized processing, display, and storag



- MBANS can reduce infection risk, increase patient mobility & improve caregiver effectiveness
- FCC issued Notice of Proposed Rule Making for MBANS to share 2360 – 2400 MHz w aeronautical telemetry
- Industry has submitted jointly agreed proposed rules
- FCC plans to adopt rules in the coming months



Conclusion

Questions?